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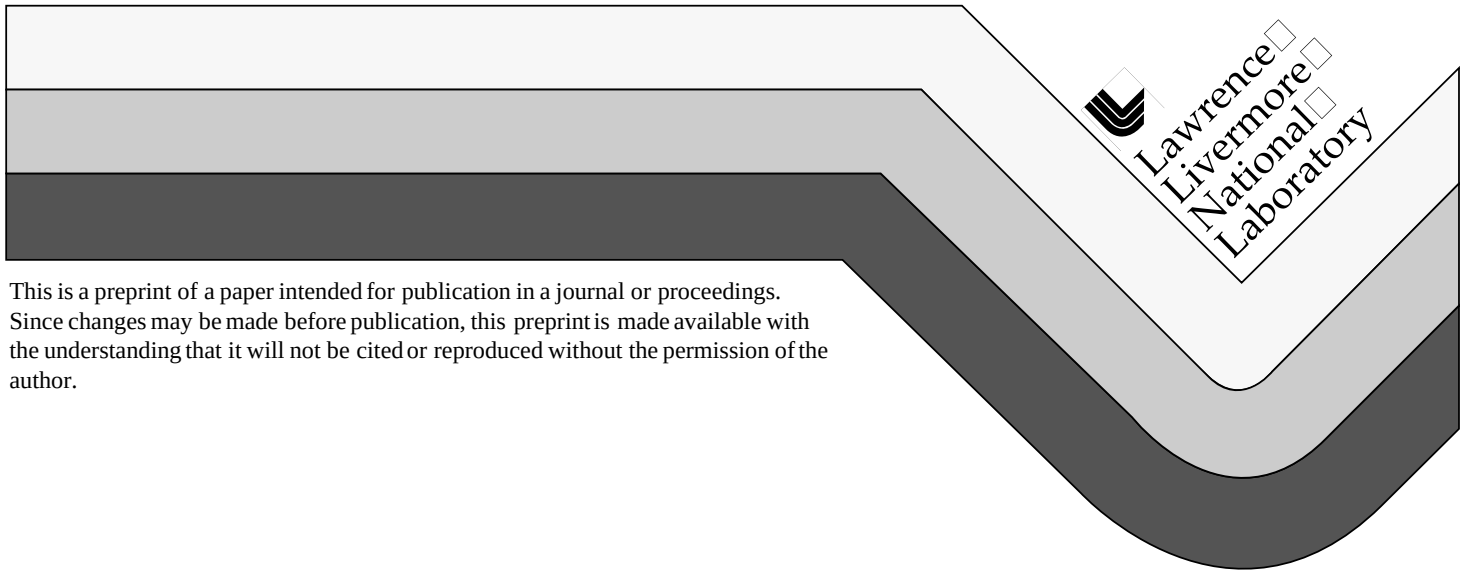

What Happened After the Evaluation?

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Abstract

An ergonomics program including a ergonomic computer workstation evaluations at a research and development facility was assessed three years after formal implementation. As part of the assessment, 53 employees who had been subjects of computer workstation evaluations were interviewed. The documented reports (ergonomic evaluation forms) of the ergonomic evaluations were used in the process of selecting the interview subjects. The evaluation forms also provided information about the aspects of the computer workstation that were discussed and recommended as part of the evaluation, although the amount of detail and completeness of the forms varied. Although the results were mixed and reflective of the multivariate psychosocial factors affecting employees working in a large organization, the findings led to recommendations for improvements of the program.

1.0 Introduction

What happens after an ergonomic analysis or evaluation is key to its effectiveness. Although efforts to address musculoskeletal disorders had been underway for years, Lawrence Livermore National Laboratory (LLNL) institutionalized a formal occupational ergonomic policy early in 1995. The program included a new approach to the evaluation of computer workstations, and three years later, an assessment of the program was conducted to assess the results.

Lawrence Livermore National Laboratory is a research and development facility maintaining a total of approximately 10,000 employees and contractors in diverse individualized divisions. The implementation of most programs within this culture varies and may be likened to implementing a program in a decentralized international corporation. However, most divisions have depended increasingly upon computers to accomplish their work.

2.0 Training of the Ergonomic Evaluators

The new element of the computer workstation evaluation program was based on training local area or "department" ergonomic evaluators to supplement the ergonomic evaluations conducted by safety specialists whose job descriptions included conducting ergonomic evaluations. Whether the department evaluators volunteered or "were volunteered" few had been hired into jobs that included the responsibility to conduct ergonomic evaluations.

The training for the department evaluators consisted of a four-hour classroom course. The evaluators were given some general information on ergonomic principles applied to

computer workstations. After being instructed in the use of an internally standardized checklist to document the findings of the ergonomic evaluation some class time was spent in practice evaluations using classroom computer workstations. The trained evaluators were advised to consult with more experienced evaluators if they encountered situations that were more complex than those covered in the class or if they wanted more information.

Upon completion of an ergonomic evaluation, the evaluators were instructed to document the results of the evaluation on the checklist. As specified in the policy, they were advised to give a copy of the form to the subject of the evaluation, to the supervisor of the subject, to the medical department, and to submit a copy to a central collection point.

3.0 Selected Subjects

The ergonomic evaluation forms were used as a means to identify employees who had been the subjects of a computer workstation evaluation. Evaluation forms from 965 documented ergonomic evaluations conducted over two and one-half years were located. A subset conducted within 18 months by various evaluators (department and safety specialist) were selected. From the subset, 65 subjects were randomly selected and 53 of these were interviewed. Of these subjects 36 (68 percent) were female and 17 (32 percent) were male. The types of positions held by the subjects are shown in Table 1.

Table 1 Subject Job Types

Job Type	Percentage
Administrators, secretaries, information system operators (including contract)	43.39
Technical editing and publishing (editors, print shop operators, illustrators)	20.76
Scientists and Engineers (chemists, computer scientists, physicists)	20.75
Technicians (electronic technicians, security specialists, health & safety technicians)	15.10
Total	100.0

4.0 Subject Interviews

The subjects were interviewed by telephone and in their offices using a two-page questionnaire. Information about current location, job category and duties was recorded. This was compared with the information taken at the time of the evaluation.

By the end of the 18 month period over which the evaluations were conducted, half (51%) of the selected subjects had changed offices. Some had changed job duties but most were performing the same functions in another location. A number of subjects reported moving their chair with them when they changed offices, but most did not retain any more furniture than a chair.

The subjects were asked about the kinds of equipment listed in Table 2. For the chair, table/worksurface, keyboard, keyboard tray, monitor, wristrest, and telephone headset, the subjects were asked:

- Were adjustments made during the evaluation?
- Was a new equipment item recommended?
- Was the equipment obtained?

It was also noted if the item was recommended on the evaluation form. The questions about adjustments and recommendation of equipment were compared with whether the item was recommended on the form.

Table 2 Items Included in Subject Interviews

Equipment	General Questions
Chair/Model	Reason for evaluation
Footrest	Requestor of evaluation
Table/work Surface	Average Hours per Day at Workstation
Monitor/Glare Screen	Comfort Level
Wrist Rest	Breaks/Exercise
Keyboard Tray	Rest Break Software
Keyboard	Condition before and after evaluation
Telephone Headset	Were other evaluations conducted?
Mouse/Trackball	Had the subject sought medical assistance?
Lighting	Recommendations made
Vision	Was equipment obtained?
Computer Glasses	Was product information received?
Document holder	Evaluator follow-up

5.0 Findings

Although adjustments made to existing equipment during the evaluation constitute some of the most immediately effective and inexpensive corrections made, the information on the forms was not complete enough to evaluate them. Adjustments to existing equipment were noted on some of the more detailed evaluation forms, however, many of the adjustments reported by the subjects were not reflected on the evaluation forms. A few subjects reported making adjustments to their own equipment following the evaluation.

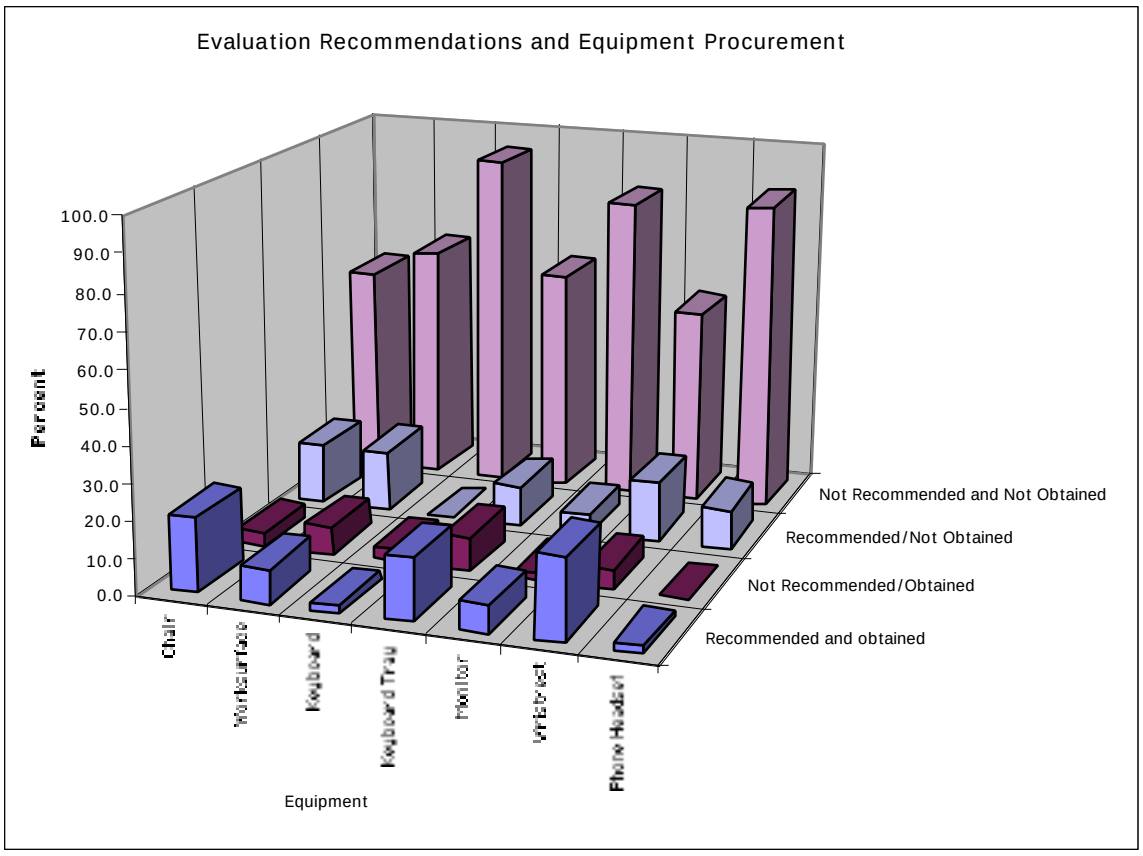

Figure 1

Variation was noted among the evaluation forms regarding how much information was included. Some forms had minimal information, other forms included a detailed description of the existing equipment and the configuration of the subject's workstation. The more detailed descriptions often included explanations of the rationale behind the recommendation and more clearly identified the products that could meet the needs of the subject.

Recommendations were considered more clearly communicated when the text included the recommendation and the product information. In a number of cases it was difficult to identify whether an item was recommended. The part of the form used for making a recommendation varied. However, for the purposes of the analyses, the recommendation was counted if it appeared in any section of the form.

Figure 1 shows the percentage of items recommended and obtained by type of equipment. The strongest interaction was that when equipment was not recommended, it was most often not obtained. A recommendation on the form was strongly related to whether the item was obtained for all items except the phone headset and the worksurface. When adjustable height worksurfaces were recommended, the cost influenced whether the item was obtained. The perceived financial status of the organization in which the subject worked also influenced whether equipment was purchased. The job type of the subject had a less clear influence on whether the equipment was obtained.

Some items were obtained when they were not recommended on the form. In a few of these cases the subject stated the item had been ordered before the ergonomic evaluation was conducted. The evaluator may not have felt a need recommend an item already ordered, although some of the more complete forms did mention when items had already been ordered. In other cases the subject wanted the item whether it was recommended or not. In a few cases the evaluations were motivated by the subject's belief that a particular piece of equipment would be beneficial. Although it was not statistically tested, the completeness of the forms was believed to correlate with the rates at which the equipment was obtained.

More than half (53 percent) of the 53 interview subjects said the reason they had the ergonomic evaluation was related to experiencing discomfort. Of the subjects (43 percent) who stated their condition had stayed the same, most reported not having any initial discomfort. A few subjects reported they had developed new conditions since the ergonomic evaluation had been conducted.

Table 3 Subject Reports of Condition After Evaluation

	Better	Same	Worse	Total
Number	27	23	3	53
Percentage	51%	43%	6%	100%

Two subjects stated they had developed discomfort in different areas because of changes made during their ergonomic evaluations. They both requested another evaluation and improved after additional modifications were made. The initial ergonomic changes had altered one part of the workstation without taking the relationship with other parts of the workstation into consideration.

It was not possible to determine precisely the effect of the computer workstation evaluations on OSHA recordable injuries and illnesses. However, computer-related repetitive motion cases accounted for almost 30 percent of the Lost Work Days (LWD) and almost 50 percent of the Restricted Work Days (RWD) in 1995. As illustrated in Figure 2, these percentages decreased in 1996. The LWD percentage of the total again decreased in 1997, though the percentage of RWD was somewhat higher. A definitive trend is unclear from this data and the 1998 statistics were not yet available. More detailed analyses would be needed to reach conclusions about the effects of ergonomic evaluations of computer workstations.

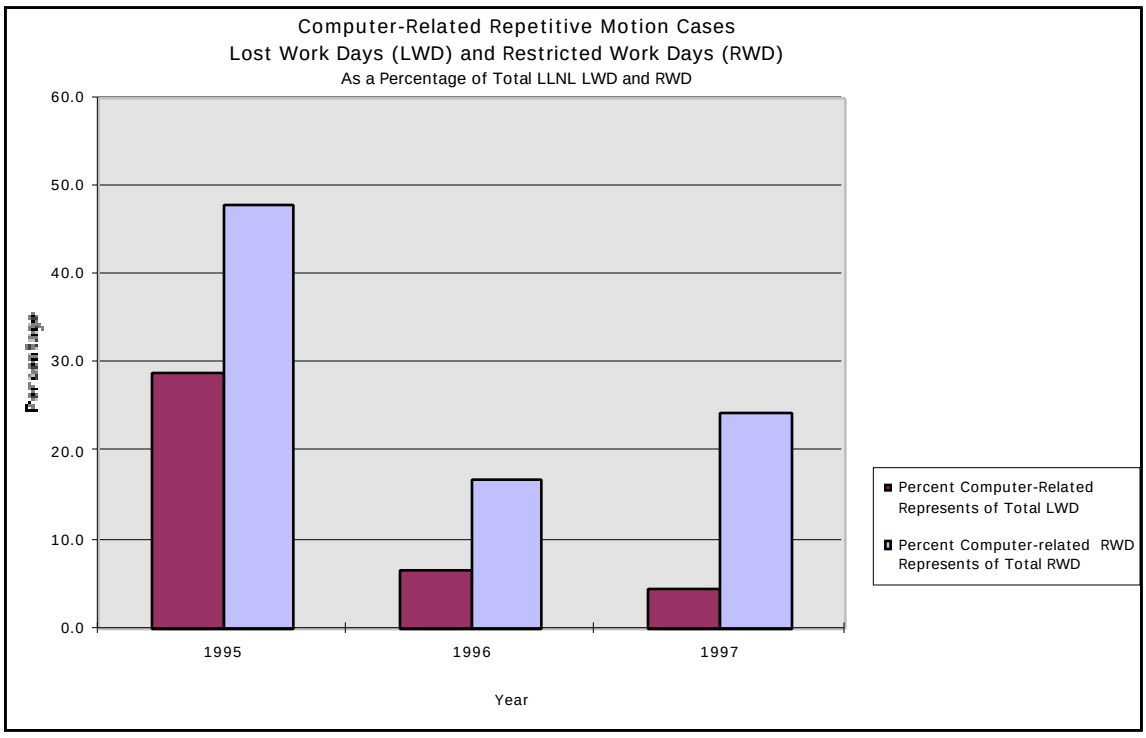

Figure 2

6.0 Results

What happens after an ergonomic evaluation is conducted is key to its effectiveness. The quality of the evaluation also is key. The assessment of the computer workstation evaluation program allowed some recommendations to be made for improving the quality of the evaluations. These recommendations can be incorporated into the training of the evaluators, the tools they use, such as the checklist, and the system that supports the program. Organizational changes are more challenging but can be influenced. Some of the recommendations that were made included:

- Changes to the checklist used by the evaluators;
- Changes in the training course for the evaluators and the addition of a refresher course;
- Instructions given to the evaluators for thoroughly completing the forms, for providing product information, the importance of follow-up, and instructing the subjects in operating new or existing equipment.
- Changes in the policy guidance; and
- Recommendations for providing institutional funding for the purchase of ergonomic equipment.

7.0 Acknowledgement

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